

## C L A I M S

What is claimed is:

1. Apparatus for inputting at least alpha-numeric information into a computer comprising:
  - a projector, projecting an image of at least part of a keyboard onto an inert surface;
  - at least one sensor, sensing user indicator interaction with specific locations on said image of at least part of a keyboard; and
  - at least alpha-numeric information generation circuitry employing an output from said at least one sensor for providing an at least alpha-numeric output.
2. Apparatus according to claim 1 and also comprising a wireless communicator operative to provide said at least alpha-numeric output in a wireless manner to a receiver.
3. Apparatus according to claim 2 and wherein said wireless communicator comprises a cellular telephone.
4. Apparatus according to claim 3 and wherein said cellular telephone includes a housing, in which housing are mounted said projector, said at least one sensor and said at least alpha-numeric information generation circuitry.
5. Apparatus according to claim 1 and also comprising comprises a personal digital assistant.
6. Apparatus according to claim 2 and wherein said personal digital assistant includes a housing, in which housing are mounted said projector, said at least one sensor and said at least alpha-numeric information generation circuitry.
7. Apparatus according to claim 1 and wherein said at least one sensor comprises at least one infra-red illuminator, directing infra-red radiation over said image of at least part of a keyboard onto an inert surface and at least one infra-red sensor for

sensing infra-red light scattered from at least one user indicator.

8. Apparatus according to claim 2 and wherein said at least one sensor comprises at least one infra-red illuminator, directing infra-red radiation over said image of at least part of a keyboard onto an inert surface and at least one infra-red sensor for sensing infra-red light reflected from at least one user indicator.

9. Apparatus according to claim 3 and wherein said at least one sensor comprises at least one visible light illuminator, directing visible radiation over said image of at least part of a keyboard onto an inert surface and at least one visible radiation sensor for sensing visible light scattered from at least one user indicator.

10. Apparatus according to claim 4 and wherein said at least one sensor comprises at least one visible light illuminator, directing visible radiation over said image of at least part of a keyboard onto an inert surface and at least one visible radiation sensor for sensing visible light reflected from at least one user indicator.

11. Apparatus according to claim 1 and wherein said user indicator is a user finger.

12. Apparatus according to claim 1 and wherein said user indicator is a user held stylus.

13. Apparatus according to claim 1 and wherein said projector comprises a point light source illuminating a mask defining said image of at least part of a keyboard.

14. Apparatus according to claim 13 and also comprising a mirror directing light passing through said mask onto said inert surface.

15. Apparatus according to claim 13 and also comprising at least one lens directly light from said point source through said mask.

16. Apparatus according to claim 13 and wherein said point light source comprises a diode laser.

17. Apparatus according to claim 13 and wherein said mask is formed to define a distorted representation of said image of said at least part of a keyboard in order to compensate for distortions in said projector.

18. Apparatus according to claim 13 and wherein said mask is a dynamically changeable mask.

19. Apparatus according to claim 7 and wherein said infra-red illuminator comprises a cylindrical reflecting element receiving light from a point source and producing a generally flat, generally radially-directed light distribution.

20. Apparatus according to claim 8 and wherein said infra-red illuminator comprises a cylindrical reflecting element receiving light from a point source and producing a generally flat, generally radially-directed light distribution.

21. Apparatus according to claim 9 and wherein said visible radiation illuminator comprises a cylindrical reflecting element receiving light from a point source and producing a generally flat, generally radially-directed light distribution.

22. Apparatus according to claim 10 and wherein said visible radiation illuminator comprises a cylindrical reflecting element receiving light from a point source and producing a generally flat, generally radially-directed light distribution.

23. Apparatus according to claim 1 and wherein said at least one sensor comprises an array of discrete sensing elements and at least one lens operative to image a region overlying each of a plurality of keyboard locations onto a corresponding at least one of said array of discrete sensing elements.

24. Apparatus according to claim 1 and wherein said at least one sensor

comprises an a position sensitive detector and at least one lens operative to image a region overlying each of a plurality of keyboard locations onto a corresponding region on said position sensing detector.

25. Apparatus according to claim 7 and wherein said at least one infra-red illuminator is operative to direct infra-red radiation at a plurality of levels over said image of at least part of a keyboard and said at least one infra-red sensor is operative to sense infra-red light scattered from at least one user indicator at a plurality of locations therealong.

26. Apparatus according to claim 8 and wherein said at least one infra-red illuminator is operative to direct infra-red radiation at a plurality of levels over said image of at least part of a keyboard and said at least one infra-red sensor is operative to sense infra-red light reflected from at least one user indicator at a plurality of locations therealong.

27. Apparatus according to claim 9 and wherein said at least one visible radiation illuminator is operative to direct visible radiation at a plurality of levels over said image of at least part of a keyboard and said at least one visible radiation sensor is operative to sense visible radiation light scattered from at least one user indicator at a plurality of locations therealong.

28. Apparatus according to claim 10 and wherein said at least one visible radiation illuminator is operative to direct visible radiation at a plurality of levels over said image of at least part of a keyboard and said at least one visible radiation sensor is operative to sense visible radiation light reflected from at least one user indicator at a plurality of locations therealong.

29. Apparatus according to claim 1 and wherein said projector comprises a diffractive optical element, which when illuminated produces said image of at least part of a keyboard onto said inert surface.

30. Apparatus according to claim 1 and wherein said projector comprises a spatial light modulator, which when illuminated produces said image of at least part of a keyboard onto said inert surface.

31. Apparatus according to claim 30 and wherein said spatial light modulator comprises a dynamic spatial light modulator which is responsive to an electrical input for producing a dynamic image onto said inert surface.

32. Apparatus according to claim 1 and wherein:  
said projector protects an image of at least part of a keyboard and of mouse functionality onto said inert surface; and  
said at least one sensor senses user indicator interaction with specific locations on said image of said mouse functionality.

33. Apparatus for inputting at least cursor-control information into a computer comprising:  
a projector, projecting an image of at least part of mouse functionality onto an inert surface;  
at least one sensor, sensing user indicator interaction with specific locations on said image of at least said mouse functionality; and  
at least cursor control information generation circuitry employing an output from said at least one sensor for providing an at least a cursor control output.

34. A wireless system for web browsing comprising:  
a wireless communicator providing web browsing functionality; and  
at least one projector mounted on said wireless communicator and projecting an image of a display onto a surface.

35. A wireless system for web browsing comprising:  
a wireless communicator providing web browsing functionality;  
at least one projector mounted on said wireless communicator and projecting an image of at least part of a keyboard onto a surface.

36. A wireless system for web browsing comprising:  
a wireless communicator providing web browsing functionality:  
at least one projector mounted on said wireless communicator and projecting an image of at least part of a keyboard onto a surface;  
at least one sensor, sensing user indicator interaction with specific locations on said image of at least part of a keyboard; and  
at least alpha-numeric information generation circuitry employing an output from said at least one sensor for providing an at least alpha-numeric output.

37. A wireless system for web browsing according to claim 36 and wherein said projector is also operative for projecting an image of a display onto a surface, whereby a user may readily view images produced during web browsing.

38. A wireless system for web browsing according to claim 37 and also comprising:  
at least one sensor, sensing user indicator interaction with specific locations on said image of said display; and  
web browsing input circuitry employing an output from said at least one sensor for providing an at least one web browsing output based on user implement actuation of locations on said image of said display corresponding to web links.

39. A wireless system for email communication comprising:  
a wireless communicator providing email communication functionality:  
and  
at least one projector mounted on said wireless communicator and projecting an image of a display onto a surface.

40. A wireless system for email communication comprising:  
a wireless communicator providing e mail communication functionality:  
at least one projector mounted on said wireless communicator and projecting an image of at least part of a keyboard onto a surface.

41. A wireless system for e mail communication comprising:  
a wireless communicator providing e mail communication functionality:  
at least one projector mounted on said wireless communicator and  
projecting an image of at least part of a keyboard onto a surface;  
at least one sensor, sensing user indicator interaction with specific  
locations on said image of at least part of a keyboard; and  
at least alpha-numeric information generation circuitry employing an  
output from said at least one sensor for providing an at least alpha-numeric output.

42. A wireless system for e mail communication according to claim 41 and  
wherein said projector is also operative for projecting an image of a display onto a  
surface, whereby a user may readily view messages during e mail communication.

43. A wireless system for e mail communication according to claim 42 and  
also comprising:  
at least one sensor, sensing user indicator interaction with specific  
locations on said image of said display; and  
email communication input circuitry employing an output from said at  
least one sensor for providing an at least one e mail communication output based on  
user implement actuation of locations on said image of said display.

44. A wireless system for mobile commerce communication comprising:  
a wireless communicator providing mobile commerce communication  
functionality; and  
at least one projector mounted on said wireless communicator and  
projecting an image of a display onto a surface.

45. A wireless system for mobile commerce communication comprising:  
a wireless communicator providing mobile commerce communication  
functionality:  
at least one projector mounted on said wireless communicator

and projecting an image of at least part of a keyboard onto a surface.

46. A wireless system for mobile commerce communication comprising:  
a wireless communicator providing mobile commerce communication functionality:

at least one projector mounted on said wireless communicator and projecting an image of at least part of a keyboard onto a surface;

at least one sensor, sensing user indicator interaction with specific locations on said image of at least part of a keyboard; and

at least alpha-numeric information generation circuitry employing an output from said at least one sensor for providing at least an mobile commerce communication output.

47. A wireless system for mobile commerce communication according to claim 46 and wherein said projector is also operative for projecting an image of a display onto a surface, whereby a user may readily view images produced during mobile commerce communication.

48. A wireless system for mobile commerce communication according to claim 47 and also comprising:

at least one sensor, sensing user indicator interaction with specific locations on said image of said display; and

mobile commerce communication input circuitry employing an output from said at least one sensor for providing an at least one mobile commerce communication output based on user implement actuation of locations on said image of said display corresponding to web links.

49. A method for inputting at least alpha-numeric information into a computer comprising:

projecting an image of at least part of a keyboard onto an inert surface;

sensing user indicator interaction with specific locations on said image of at least part of a keyboard; and

employing an output indicating sensed user indication interaction for providing an at least alpha-numeric output.

50. A method according to claim 49 and also comprising providing said at least alpha-numeric output in a wireless manner to a receiver.

51. A method according to claim 49 and wherein said sensing comprises directing infra-red radiation over said image of at least part of a keyboard on an inert surface and sensing infra-red light scattered from at least one user indicator.

52. A method according to claim 49 and wherein said sensing comprises directing visible radiation over said image of at least part of a keyboard on an inert surface and sensing visible light scattered from at least one user indicator.

53. A method according to claim 49 and wherein said user indicator is a user finger.

54. A method according to claim 49 and wherein said user indicator is a user held stylus.

55. A method according to claim 51 and wherein said directing comprises reflecting light from a point source and producing a generally flat, generally radially-directed light distribution.

56. A method according to claim 52 and wherein said directing comprises reflecting light from a point source and producing a generally flat, generally radially-directed light distribution.

57. A method according to claim 49 and wherein said sensing comprises employing an array of discrete sensing elements and imaging a region overlying each of a plurality of keyboard locations onto a corresponding at least one of said array of discrete sensing elements.

58. A method according to claim 49 and wherein said sensing comprises position sensitive detecting and imaging of a region overlying each of a plurality of keyboard locations onto a corresponding region on said position sensing detector.

59. A method according to claim 51 and wherein said directing includes directing infra-red radiation at a plurality of levels over said image of at least part of a keyboard and said infra-red sensing includes sensing infra-red light scattered from at least one user indicator at a plurality of locations therealong.

60. A method according to claim 52 and wherein said directing includes directing visible radiation at a plurality of levels over said image of at least part of a keyboard and said visible sensing includes sensing visible light scattered from at least one user indicator at a plurality of locations therealong.

61. A method according to claim 49 and wherein said projecting comprises illuminating a diffractive optical element to produce said image of at least part of a keyboard onto said inert surface.

62. A method according to claim 49 and wherein said projecting comprises illuminating a spatial light modulator to produce said image of at least part of a keyboard onto said inert surface.

63. A method according to claim 62 and wherein said projecting comprises illuminating a dynamic spatial light modulator which is responsive to an electrical input for producing a dynamic image onto said inert surface.

64. A method for wireless web browsing comprising:  
providing web browsing functionality; and  
projecting an image of a display related to said functionality onto a surface.

65. A method for wireless web browsing comprising:  
providing web browsing functionality; and  
projecting an image of at least part of a keyboard onto a surface for use with said web browsing functionality.

66. A method for wireless web browsing comprising:  
providing web browsing functionality;  
projecting an image of at least part of a keyboard onto a surface;  
sensing user indicator interaction with specific locations on said image of at least part of a keyboard; and  
generating an output useful in said web browsing functionality from said sensing for providing an at least alpha-numeric output.

67. A method for wireless web browsing according to claim 66 and wherein said projecting comprises projecting an image of a display onto a surface, whereby a user may readily view images produced during web browsing.

68. A method for wireless web browsing according to claim 67 and also comprising:  
sensing user indicator interaction with specific locations on said image of said display; and  
employing an output from said sensing for providing an at least one web browsing output based on user implement actuation of locations on said image of said display corresponding to web links.

69. A method for wireless e mail communication comprising:  
providing e mail communication functionality; and  
projecting an image of a display onto a surface for use in said communication functionality.

70. A method for wireless e mail communication comprising:  
providing e mail communication functionality; and

projecting an image of at least part of a keyboard onto a surface for use in said communication functionality.

71. A method for wireless e mail communication comprising:  
providing e mail communication functionality;  
projecting an image of at least part of a keyboard onto a surface;  
sensing user indicator interaction with specific locations on said image of at least part of a keyboard; and  
generating an output from said at least one sensor for providing an at least alpha-numeric output useful in said communication functionality.

72. A method for wireless e mail communication according to claim 71 and wherein said projection comprises projecting an image of a display onto a surface, whereby a user may readily view messages during e mail communication.

73. A method for wireless e mail communication according to claim 72 and also comprising:  
sensing user indicator interaction with specific locations on said image of said display; and  
employing an output from said sensing for providing an at least one e mail communication output based on user implement actuation of locations on said image of said display.

74. A method for wireless mobile commerce communication comprising:  
providing mobile commerce communication functionality; and  
projecting an image of a display onto a surface for use in said communication functionality.

75. A method for wireless mobile commerce communication comprising:  
providing mobile commerce communication functionality; and  
projecting an image of at least part of a keyboard onto a surface.

76. A method for wireless mobile commerce communication comprising:  
providing mobile commerce communication functionality;  
projecting an image of at least part of a keyboard onto a surface;  
sensing user indicator interaction with specific locations on said image of  
at least part of a keyboard; and  
generating an output from said at least one sensor for providing at least  
an mobile commerce communication output.

77. A method for wireless mobile commerce communication according to  
claim 76 and wherein said projection comprises projecting an image of a display onto a  
surface, whereby a user may readily view images produced during mobile commerce  
communication.

78. A method for wireless mobile commerce communication according to  
claim 77 and also comprising:  
sensing user indicator interaction with specific locations on said image of  
said display; and  
employing an output from said sensing for providing an at least one  
mobile commerce communication output based on user implement actuation of  
locations on said image of said display corresponding to web links.

79. A method according to claim 49 and wherein:  
said projection projects an image of at least part of a keyboard and of  
mouse functionality onto said inert surface; and  
said sensing senses user indicator interaction with specific locations on  
said image of said mouse functionality.

80. A method for inputting at least cursor-control information into a  
computer comprising:  
projecting an image of at least part of mouse functionality onto an inert  
surface;  
sensing user indicator interaction with specific locations on said image of

at least said mouse functionality; and

generating an output from said at least one sensor for providing an at least a cursor control output.